CLIPSAL INTEGRATED SYSTEMS

C-Bus training Course

Introduction to C-Bus
Trainee Notes

Revision Number: V1.3

V1.3 April 2006

Day1

Set up and check training boards. Load software if not already loaded on computers. Check USB adaptor / serial comms to boards.

Introduction

Web Site: **www.clipsal.com.cis**
Technical Support Phone: 1300 722 247

Housekeeping

Mobile phone issues.
Please put mobile phones on silent and take the call outside the training room if you are unable to turn it off. Any training missed due to taking phone calls will have to be picked up in your own time.

The training course is not specific to a particular installation.
Hence we are not programming one trainee's current or future installation.

Introduction to CIS and Products.

1994 was the first job in C-bus at the ETSA building No1 Anzac Hwy Adelaide (still working)
1995 C-bus officially released.
C-bus programming has evolved through three software packages.
We now use a program called 'C-Bus Toolkit' to program C-Bus.

This is a 'windows' based package, making navigation of the software familiar to many users.
The largest Job to date is the Telecom Towers in Malaysia 60 Networks.

Intro and concepts (Introduction to C-Bus P2)

Units

System Units (System Support Devices) (P5 Introduction to C-Bus Manual) (C-Bus Hardware Manual)

Power Supplies (P15 Introduction to C-Bus Manual)

Power Supplies do not show on network.
What is the C-Bus voltage, how many power supplies can be used? **(36V up to 2A Max.) (Recommended Min 20V).**
Output units & current requirements for input units (see table & calculation sheet in manual).

PCI & CNI

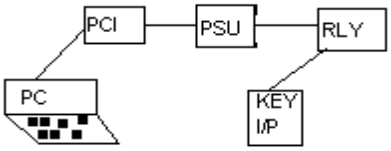
Bridges (P4 C-Bus Hardware Manual)

90% of networks are single networks so bridges are usually not needed.
Bridges can be set up to allow networks to talk to each other
No power or Clock across bridges

Input Units (P5 Introduction to C-Bus Manual) (C-Bus Hardware Manual)
Output Units (P5 Introduction to C-Bus Manual) (C-Bus Hardware Manual)

Basic Network (P5 Introduction to C-Bus Manual)

Basic Network showing separate Power Supplies.



Units Per Network (P18 Introduction to C-Bus Manual)

100 Units per Network average unit draws 18mA (22mA for Neo).(Max current 2A)
Use C-Bus calculator

C-Bus Operating Parameters

Max total cable length 1000 meters (1km) per network.
Max 255 networks
1 Burden per network
At least 1 clock (max 3) per network. (Only 1 clock is Active, the others are Enabled, ready to Activate if needed).

Cable (P9 Introduction to C-Bus Manual, P2 C-Bus Concepts)

Cat5 cable *(Electrical Characteristics, Impedance)* (90 Ohms / 1Km return)
Why UTP? (Noise reduction)
Colour code on the Cable, why two cores instead of one? (Current Rating 2A)
Why Pink? Only one brave enough to use pink (can tell that it is used for C-Bus) also Sheath is 240V Mains Rated. (Still allow separation & segregation)
Cable segregation
The C-Bus Pink Cat 5 UTP, has a mains rated outer sheath.
When running the C-Bus cable in parallel with mains, maintain 150mm segregation between the two cables at all times.
Where C-Bus needs to cross mains cable at least 60mm separation, and C-Bus cable crosses at a 90 degrees.
Check local Electrical Wiring Standards for compliance.
Orange and Blue – Positive Supply
Orange/White and Blue/White – Negative Supply
Remote Override – Green & Green/White ON, Brown & Brown/White OFF (Switched to Negative Supply).

Cable Terminations

Twist the pair together or use a bootlace crimp.
Do not solder to join the cables when secured in a screw terminal. This may cause cold creep.
When twisting the pair together, avoid frayed terminations.

Network Burden (P17 Introduction to C-Bus Manual, P8 C-Bus Concepts Manual)

Why do you need a Network Burden? Is it important? The Network Burden provides a standard impedance to a C-Bus Network, and will ensure correct and reliable communications.
What is a Network Burden? 1Kohm resistor in series with 10µF – 22uF/50v capacitor.
Different types of Network burden
RJ45 Version comes with a PC Interface
Leaded version similar to RJ45 version
Software selectable Burden

C-Bus System Clock (P7 C-Bus Concepts Manual)

What is a system clock and why do we need it? (Bipolar 2.5v pulse of 296µS every 2mS. Synchronises data transmission after pulse)

Addressing Structure (P21 Introduction to C-Bus Manual, P9 C-Bus Concepts Manual)

Why we use Hex (difference between hex and decimal & Hex used in the program but converted to decimal / tags by the computer).

Network Address

Unit Addressing

Unique addressing of units.

Group Addressing (P23 Introduction to C-Bus Manual, P11 C-Bus Concepts Manual)

Input and output units communicate with each other.
Each group address can have a unique description (Tag).
Multi way switching. Switches do not have to correspond to lights in the room.

Area Addressing (P24 Introduction to C-Bus Manual, P11 C-Bus Concepts Manual)

How it works
Why we use it

Application Addresses (P21 Introduction to C-Bus Manual, P10 C-Bus Concepts Manual)

As with unit addresses we have 255 Application addresses.
Currently we use application 56 for lighting and 136 For Heating.
We also use 202 for Trigger Control application (For Scenes in C-touch etc) and 203 for Enable (for Schedules in C-touch)

Network Variable

C-Bus Indicators (P13 C-Bus Hardware Manual)

All C-Bus Output Units (excluding the IR Transmitter) have three types of indicators.

UNIT LED: -

Indicates the status of the individual unit. Local or Remote Overrides have been toggled.
Indicates if mains power is present to the unit.

C-BUS LED: -

Indicates presence of a C-Bus Clock.
Indicates an acceptable C-Bus Voltage.

LOCAL TOGGLE INDICATOR: -

Shows the status of each channel on the particular output unit.
Manually overrides each channel.
Used in Learn Mode programming.

Tools & Functions

TAGS

All C-Bus Addresses are given names, known as Tags.
All Tags may be user defined to meaningful names.
Tags are only stored in the C-Bus Software on the PC. No tags at all reside in any C-Bus Units.
Part Name & Project name stored in units.
'Set Project to All' function of Toolkit.

C-Bus Toolkit - Software Navigation (C-Bus Toolkit Software Manual)

'Toolkit' and the commonly used buttons (icons).
Project Manager.
Add a new project.
Navigate around project Manager. (Project, Network, Units)
Scan the network and display GUI of Dimmer and Relay and Key input. (Brief, details covered later).
Difference between Units in Database and Units on Network.
If you edit units on the Database and do not 'save to physical unit' it does not reflect the real network.

Exercise 1. (Assistance from trainer)

Toggle / Retrig Timer, Memory / Toggle Dimmer and passing on of timers.

Exercise 2.

- Do exercise 2 with less assistance.
- Problem with this method of Master Control, is excessive current switching.
- Turn on loads before continuing.
- Is this a better method of control? Yes, loads ramp off.

Short Press / Long press

Short press, long press and use of for programming / operation of units.

Key Functions (Short Press / Long press etc)

Short Press (SP) – Always sent.

Short release (SR) – Sent if Key releases before 400mS (or whatever time is set for LP)

Long Press (LP) – Sent after 400mS (or whatever time is set for LP)

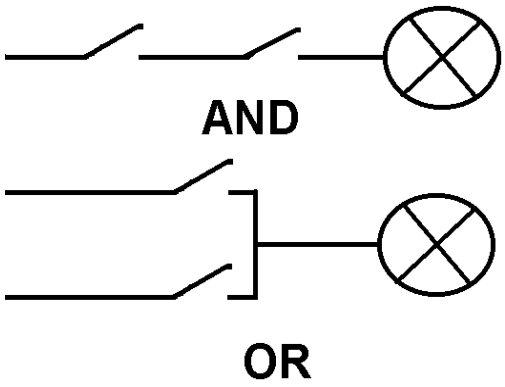
Long Release (LR) – Sent when key releases after LP.

Debounce. purpose of. (48mS default).

Micro functions.

Logic

There are two types of Logic "AND" & "OR" (Min and Max on the Dimmer)



Programming exercise 3

Dimmer Loads

Load types. (Fluorescent, Compact Fluorescent, Incandescent, Electronic Transformers, Iron Core Transformers.)

Electronic transformer compatibility. (Refer to table & calculation sheet in manual).

Dimmer types - Leading Edge, Trailing Edge.

Iron Core transformers, use Lamp Load + 20% to allow for losses. (Iron loss, Eddy Current, Copper Loss).

Use Leading Edge with Electronic Transformers 300nF or 1000nF Pro Series.

240V on Dimmer Outputs

The dimmer outputs do not switch off at 0%, there is still voltage present. Need to isolate supply to dimmer before working on circuits.

Fan Speed Control (depending on State & Trainee requirements, how much detail is covered here)

Here are a number of workable solutions.

2 sections.

A. Where the fan is suitable to be used on a dimmer channel i.e. where a little bit of fan noise is not a problem.

Discuss 4 options here-

Use a single button set as a dimmer - set min turn-on to 35% - extend the ramp1 time to 8 or 12 secs to roughly match the fans ability to alter its speed.

Use a single button to give 2 speed operation, say 90% and 50% - set the max turn-on to 90% - short press will then toggle between 90% and Off - use long press, Recall1 to obtain 50%.

Use 2 keys to give High, Med and Low - button 1 will toggle between High and Off - button 2 will use Recall1 on Short Press, and Recall2 on Long Press, to give Med and Low.

Use 4 keys, High-Upkey, Med- Recall1, Low-Recall2, Off –Offkey.

B. Where fans must be almost silent, therefore using capacitor control.
4 options-
Use 2 keys - one for Med and one for Low (each switch in a certain value of capacitance) - both keys are pressed for High (this switches in both capacitors and gives a speed close to high) this uses 2 relay channels.

As above but using 4 keys - button 3 will have the block allocation to turn on both Med and Low to give the high speed.

Using 3 relay channels is possibly the best option but quite expensive - use scenes to give a 4 button operation - High, Med, Low, Off. (or 3 different turn on levels of the same GA. problem is that the indicator does not indicate the fan speed.

As above, but by having a Scene Trigger Group and Action Selectors can give the same operation on 2 keys, (Requires a device capable of storing scenes eg C-touch, PAC. etc).

A regular method used in Queensland of using two relays where by the fast speed is attained by having both capacitors in circuit together. There is a possibility of the voltage across the capacitors or the fan exceeding that of line voltage. It has been suggested that if this method of control is employed that the voltage across the capacitors and the fan motor are checked to confirm that there is not an excessive p.d.

As xl approaches xc the voltages will rise and could exceed line voltage across both elements

This problem can be somewhat dangerous giving the fact that the inductive reactance of the motor is of an unknown value to most electricians, and hence they cannot calculate when resonance would occur, as they only have the capacitors value, which they could calculate the capacitive reactance from.

This problem could case failure of the capacitors or fan motor.

RJ45 Connections on C-Bus Units

C-Bus

RS232

Warn ing -- DO NOT connect computer to the C-Bus RJ45 on the PCI.

Exercise 4.

The idea of the Theatre exercise with the Corporate Boxes is not to impact on the theatre performance.

Min Logic similar to "and" and is used to prevent the above.

Exercise 5.

PE Cell (Light Level Sensor) (P6 Basic Programming Manual)

Show the PE Cell GUI.

Level Control will try to achieve the level set by the PE cell it will do this by dimming the lighting set in the Level Control.

On/Off will switch off a Group Address when the PE cell reaches a certain level.

Enable is the group address that switches the PE Cell on.

Exercise 6.

PIR (P8 Basic Programming Manual)

3 Models available

5750L WP outdoor Infrascan 18m

SENPIROA

SENPIRSS (old units)

5751L indoor Infrascan 8m 90°

SENPIRIA

SENPIRSS (old units)

5753L 360° indoor Infrascan

SENPIRIB

PIR GUI

Trim Pot fully anti – clockwise

Sunset turn pot clockwise and back off ¼ turn. (LED may prevent light level working).

Learn Mode

Demonstration of Learn Mode and showing that a clock can be switched on when entering learn mode. Also use of Advance learn mode (Super Learn Mode) ability to turn on burden which will alter the output unit address to 01 and blank (unused) the channels unless you turn off the indicators.

Analogue Dimming

See for Page 12 for details.

DSI Ballast

See Page 13 for details.

END DAY 1

Revision & Case Study

Assessment. Complete theory questions before tomorrow.

Installing New Units

All new C-Bus units have a default Unit Address of 255.

Many different ways to implement.

1. Create your database and program all units. (Set unit addresses, group addresses, networks etc)

   Install units on site and note serial numbers against unit locations. (Either on plan or fix serial numbers from boxes to units.

   Scan the network in and resolve any conflicts (Unravel etc).

   Use 'Set address to database' to readdress units on network to match your database.

   (you can either transfer unit programming at this time, or leave until all units matched, then transfer database to units on network). (If you transfer data as you readdress units, you may miss those units which do not need to be readdressed, so latter method is preferrable).

2. Before delivery of C-Bus product to site, the units may be pre-programmed.

   Using a C-Bus Power Supply and a PC Interface, program the unit to a new unique Unit Address.

   Program C-Bus unit with all other relevant addresses.

   Take C-Bus products to site and install.

Barcode Scanning is an alternative.

Unit Types (as used on Training Board)

Unit Type	Description	Part No.
PCINT4	DIN Rail PC Interface	5500PC
RELDN12	DIN Rail 12 Channel Voltage Free Relay 10A per Channel	L5512RVF
DIMDN8	DIN Rail 8 Channel Dimmer, 1A per Channel	L5508D1A
KEY1	1 Gang Key Input Unit	5031NL
KEY2	2 Gang Key Input Unit	5032NL
KEY4	4 Gang Key Input Unit	5034NL
KEYM4	4 Gang NEO Key Input Unit	5054NL
KEYM8	8 Gang NEO Key Input Unit	5058NL
SENLL	Light Level Sensor	5031PE
SENPIRIA (SENPIRSS) old units	Passive Infra-Red Motion Detector, Indoor, Corner Mount	5751L

Project Manager & Planning

Scope of works.
Define the Project.
Plan – Product / Hardware.
Power supply calculation.
Program units with Unit Addresses, save to Database and clearly label C-Bus unit and box with mounting location, and unit address. Ensure means of knowing physical location of units. ie Use meaningful labels in database.
Send units to site with the plan to provide correct installation position.
Edit project Database and assign group addresses.
Visit the site and download data to network.
Test and commission system and if needed, alter programming.
Backup project and document. Leave a copy on site.
Follow up visit to site at later date to fine tune to customer's satisfaction.
Update backups & documentation. Leave a copy on site.
Creating / Restoring backups. (.cb3 files)

Adding Units to DataBase

Exercise 7

Scenes

What is a scene? A Scene is a combination of outputs coming on, going off or dimming to a particular level. Scenes are used to create a 'mood' in a room or an area. As an example of a scene, imagine the following scenario: You have asked your guests to come to the dinner table and the lights in the dining room are fully on so everyone can see their way to their places. Now that they are seated you, press a scene button. The lights over the table dim gradually to a level appropriate to light the dinner party and the downlights over the serving area turn up so that you can uncork the first bottle of wine for the night…
Programming scenes may be done in the Saturn, Neo and Reflections Input Units as well as the MultiSensor. These units have an area of memory for storing Scene information.
The number of possible Group Addresses in the NEO is constant but can be divided up differently according to your needs. If you want lots of Group Addresses included in your Scenes then you can't have as many scenes. Conversely, if you only want a small number of Group Addresses in a Scene you can have lots of Scenes. You can think of this memory area as a "bucket of Group Addresses" that you can draw from, and once you have used them all up then that is all the scenes you can have.
The exact number is forty Group Addresses over a maximum of 8 scenes, with no scene containing more than 10 Group Addresses.
You can have four Scenes, each with ten Group Addresses (which will use up 100% of the Scene Bucket) or you can have eight Scenes each with five Group Addresses.

Methods for selecting Group Addresses for scene (Double click, multiple selection etc.)

Exercise 8

Exercise 9 (C-Bus House Exercise)

Load (restore) faulty project to PC. (Faulty1.cb3)

END DAY 2

Bridges (P4 C-Bus Hardware Manual)

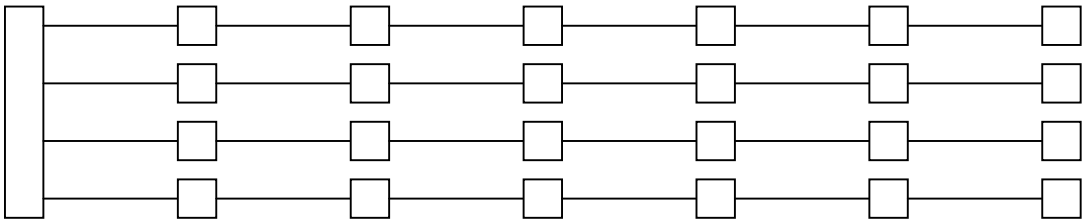
Configuration of Bridges, topology Map

You can control the same group addresses across the networks, also the group addresses might be the same but the descriptions can be different.

Also the descriptions may be the same, but different group addresses.

Fault Finding

Fault finding procedures / tools. Principles of fault finding using a multimeter. Measure C-Bus voltages + to – and also + & - to earth should be equal (approx ½ C-Bus Voltage). Resistance measurement to locate shorts or opens. (90 ohms / 1KM).
Use C-Bus LEDS.
Use Application log to see what unit issued a command.
Fault finding chart.
A typical example.



Output Units Key Units

A network with units connected in a combination Daisy chain / Star topology has failed. The key input units are not functioning. The C-Bus status LED is OFF. The installation has ample power supplies and has been functioning correctly since installation.

Exercise 10

Load **faulty1.cb3** to training board if not already done.
Find, fix & document faults.

This exercise, when working correctly, should have the 4 Key Unit buttons 1 to 4, switching Lamps 1 to 4 ON & OFF.
The 8 Key NEO should be operating as toggle dimmers on Lamps 1 to 8 respectively.

12 Channel Relay Unused

1 Key Unit Unused

2 Key Unit Unused

4 Key NEO Unused.

Light level sensor & PIR Unused.

Diagnostic kit

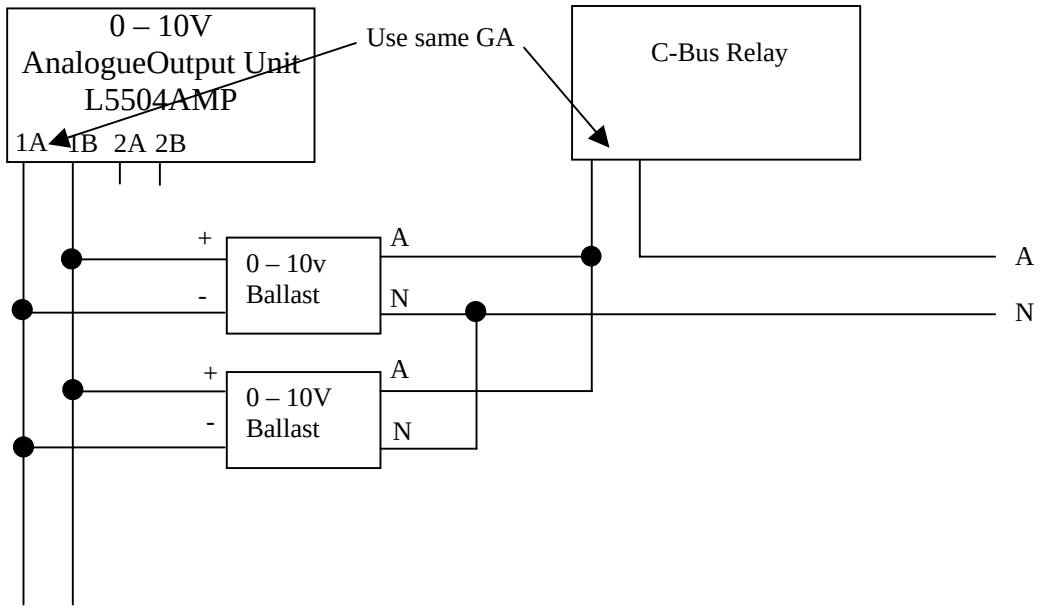
What it does. Does not show tags and it can operate in either Hex or Decimal.

Wireless

Demo of wireless products.

Analogue Dimming (0 – 10V)(if not covered on Day 1)

To dim fluorescent lights the Fluorescent ballast needs to be dimmable.
The dimming control is usually 0-10v.
To be able to achieve dimming with C-Bus, the Fluorescent ballasts need to be wired into 5104AM or a 5504AM. (General guide 10 ballasts/channel of
analogue output. Check ballast specification)
With 0 – 10V ballasts, a relay must be fitted, because the lamps do not turn off at 0%.



NOTE: Polarity is important.

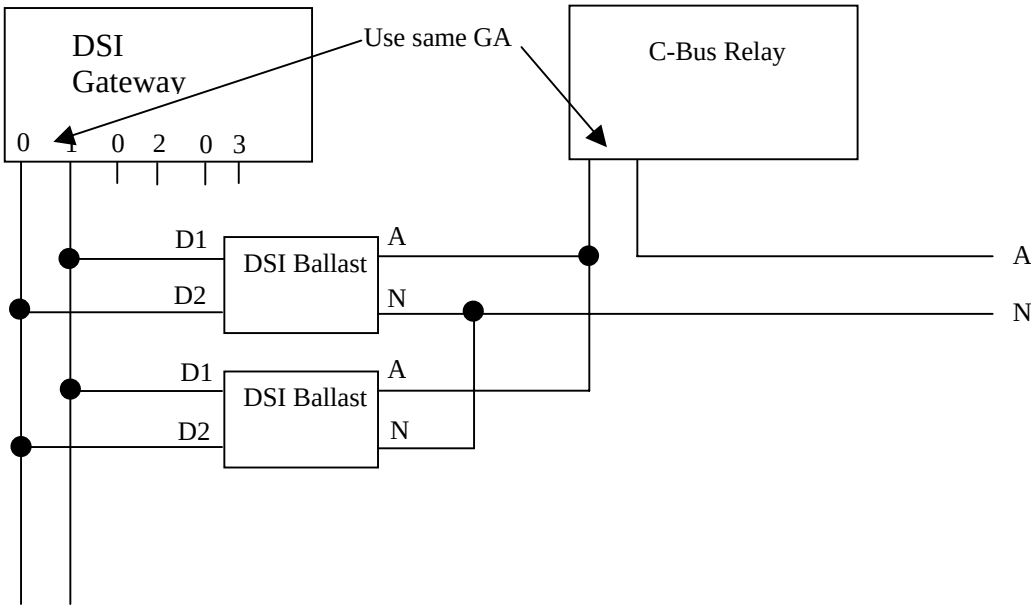
The control lines should be wired with a mains voltage rated cable.

DSI Gateway (if not covered on Day 1)

An easy way to dim Fluorescent is to use a DSI Controller.
The Ballast needs to be a DSI Ballast. (Usually about 100 Ballast /channel. Check ballast specification)

If you have a large number of DSI ballasts, consider fitting a relay as shown (This will save energy in the off state), for a small number of ballasts, the relay can be omitted.

The DSI system will however turn the lamp off at 0%, unlike 0 – 10V ballast.



NOTE: Polarity is important.
The control lines should be wired with a mains voltage rated cable.

DALI Gateway

Finish

CLIPSAL INTEGRATED SYSTEMS

C-Bus training Course

Introduction to C-Bus
Exercises

Name: _____ Date: _____

Trainer: _____

Revision Number: V1.2

V1.2 February 2006

Exercise 1 – Basic

- **Program 8 Channel Dimmer**

  Ch1 = BoardRoom Lights.
  Ch2 to Ch8 = Unused.

- **Program 12 Channel Relay**

  Ch1 = Office Lights
  Ch2 = Store Lights
  Ch3 = Accounts Office

- **Program 2 Key Switch**

  K1 = Office Lights, on/off.
  K2 = Board Room Lights, preset 30%

Program 4 Key Switch

K1 = Office Lights, on/off.
K2 = Store Lights, 5 sec timer (Toggle Timer)
K3 = Accounts Office, on/off.
K4 = Board Room Lights, Dimmer (Toggle)

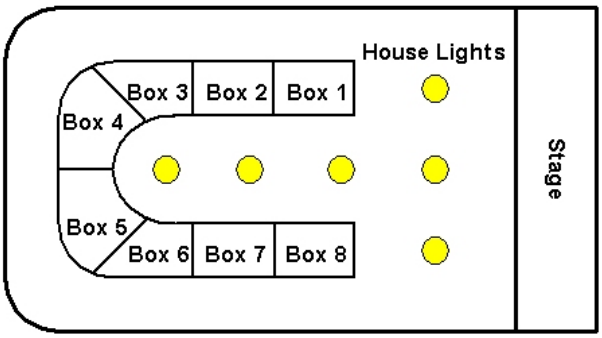
Exercise 2 - Area Addressing

- Program the 1 Key Input to Master, with an on/off function.
- Apply Master to the Area Address of the relay & dimmer.
- Test to see what happens.
- Are there any problems with using this feature as a Master Control?
- Apply custom ramp off commands and adjust ramp times on the 1 Key Unit.
- Short Press: Idle
- Short Release: Idle
- Long Press: Ramp Off
- Long Release: Idle
- Ramp 2: 12 Seconds (Ramp 2, global tab)
- Is this a better means of control?

Exercise 3 - Logic

- Remove the ‘Master’ area address and replace with Unused in all C-Bus units.
- Program the 1 Key Input to Master, with an On/Off function.
- Program the 12 Channel Relay, go to the Logic tab and apply Master to the logic group.
- Select AND logic.
- Tick Channels 1,2 &3.
- Program the 8 Channel Dimmer, go to the Logic tab and apply Master to the logic group.
- Select Min Logic and tick Channel 1.
- Using this method it is a true master control, as nothing will operate until the master is on.

Exercise 4 - Logic



Create a new Project called Theatre

- **Program 12 Channel Relay**

  Ch1 to Ch6 = House Lights, with staggered turn on.

- **Program 8 Channel Dimmer**

  Ch1 = Box 1, Ch2 = Box 2
  Ch3 = Box 3, Ch4 = Box 4
  Ch5 = Box 5, Ch6 = Box 6
  Ch7 = Box 7, Ch8 = Box 8
  Tick all logic channels and assign House lights to Logic Group.
  MIN logic for all channels.

- **Program 1 Key Unit**

  K1 = House Lights, toggle dimmer.

- **Program 4 Key Unit**

  K1 = Box 1, Toggle Dimmer
  K2 = Box 2, Toggle Dimmer
  K3 = Box 3, Toggle Dimmer
  K4 = Box 4, Toggle Dimmer

- **Program 4 Key NEO Unit**

  K1 = Box 5, Toggle Dimmer
  K2 = Box 6, Toggle Dimmer
  K3 = Box 7, Toggle Dimmer
  K4 = Box 8, Toggle Dimmer

Exercise 5 - Light Level Sensor

1. Set Groups / Light Level = Box 8 (Ch8 of 8ch Dimmer Output Unit from prev. Ex.)
   Tick Refresh for Ambient Light if not already ticked.
   Read Lux measurement value with 'Box 8' light OFF, then read Lux with Box 8 ON, and set Target Lux to about 'OFF' level measured plus half of the difference of the two values.
   Set Margin to 10 Lux (+ or – 5Lux).
   Leave all other settings as is.

2. Set Groups / Light Level = Unused
   Set Groups / Light On/Off = Box 8
   Leave all other settings as is.

*** Note when using Light Level GA, never goes to 0% (OFF)**

Exercise 6 - PIR

Set Daytime Movement (LI) Group = Porch Light (Ch7 of 12ch Relay Output Unit from prev. Ex.)
Tick Use same response settings as 'Day-Time Movement'
Under the 'Blocks' tab, set Timer 1 to 5 Seconds.
Leave all other settings as is.

Exercise 7 – Downloading

- To successfully download a database to a C-Bus network two factors must be met: -

  - Units types on the database and units types on the network must match.
  - Unit addresses in the database and unit addresses on the network must match.
- Programming live on the network, address the following units to the Unit Addresses shown:-

- 00 = PC Interface
- 01 = 12 Channel Relay
- 02 = 8 Channel Dimmer
- 50 = 1 Key Input
- 51 = 2 Key Input
- 52 = 4 Key Input
- 53 = 4 Key NEO
- 54 = 8 Key NEO
- 150 = Light Level Sensor
- 151 = PIR

- **Disconnect from the Network, create new project called MYHOME.**
- In 'MYHOME' Database, add units with correct address and unit type to match units on the training board.
- **Program 12 Channel Relay**

  Ch1 = Outside Lights
  Ch2 = Garden Lights
  Ch3 = Kitchen Lights
  Ch4 = Bathroom Lights
  Ch5 = Hall Lights
  Ch6 = Laundry Light
  Ch7 = Porch Light
  Ch8 = Garage Light
  Ch9 = Toilet Light
  Ch10 = Stairs Light
  Ch11 = Balcony Light
  Ch12 = Front Door

- **Program 8 Channel Dimmer**

  Ch1 = Lounge Lights
  Ch2 = Wall Lights
  Ch3 = Rumpus Room
  Ch4 = TV Light
  Ch5 = Dining Room
  Ch6 = Up Lights
  Ch7 = Down lights
  Ch8 = Spot Lights

- **Program 4 Key Input**

  Key 1 = Outside Lights, 10 Second Retrig Timer.
  Key 2 = Garden Lights, on/off.
  Key 3 = Kitchen Lights, on/off.
  Key 4 = Bathroom Lights, on/off.

- **Program 4 Key NEO**

  Key 1 = Lounge Lights, Memory Dimmer, turn on maximum 80%.
  Key 2 = Wall Lights, Memory Dimmer, turn on minimum 30%.
  Key 3 = Rumpus Room, Preset 60 %.
  Key 4 = TV Light, Toggle Dimmer.

- **Program 1 Key Input**

  Key 1 = Going Out.
  (Custom)
  Short Press = Idle.
  Short Release = Ramp off.
  Long Press = Idle.
  Long Release = Idle.
  Ramp2 = 30 sec.

- **Program Dimmer and Relay**

  'Area Address' = Going Out

continued next page

Exercise 7 continued

- **Program 2 Key Input**

  Key 1 = Dining Room, On/Off.
  Key 2 = Up Lights, Toggle Dimmer.

- **Reconnect to network and download database to network**

Exercise 8 - Scenes

8 Key NEO **(Program the Trigger group to 'Training')**

- **Program Key 1 Scene, 8 sec ramp time Action Selector to 'All On'.**
  Lounge Light to 100%.
  Wall Lights to 100%.
  Rumpus Room to 100%.
  TV Lights to 100%.
  Dining Room to 100%

- **Program Key 2 Scene, 12 sec ramp time Action Selector to 'Mix Up'.**
  Lounge Light to 20%.
  Wall Light to 40%.
  Rumpus Room to 60%.
  TV Lights to 80%.
  Dining Room to 100%

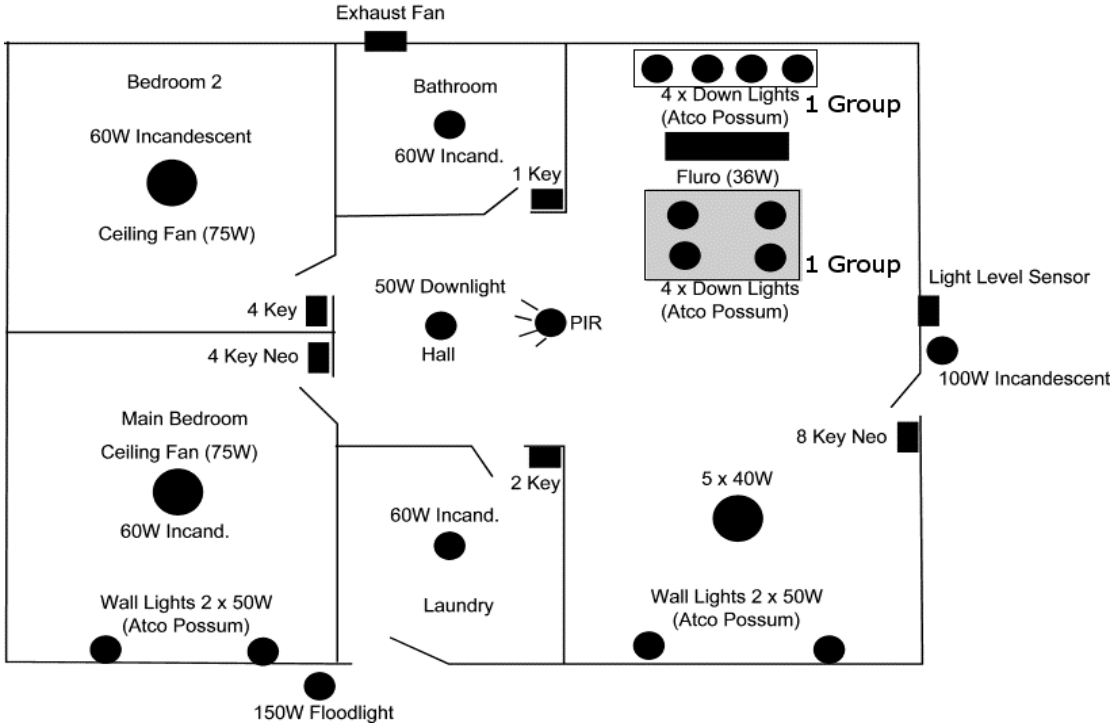
- **Program Key 3 Scene, 4 sec ramp time Action Selector to 'Mix Down'**.
  Lounge Light to 100%.
  Wall Lights to 80%.
  Spot Lights to 60%.
  TV Lights to 40%.
  Dining Room to 20%.

- **Program Key 4 Scene, 12 sec ramp time Action Selector to 'All Off'**.
  Lounge Light to 0%.
  Wall Lights to 0%.
  Rumpus Room to 0%.
  TV Lights to 0%.
  Dining Room to 0%

Exercise 9 C-Bus House Design

- This exercise makes use of all the units on the C-Bus Training Board to simulate a real world installation. The customer has provided the following information, including suggested scenes. You are required to implement the customer's requirements and find solutions for any areas not specified.
- The following is the house layout plan showing loads & switch positions.
- Program the Key Input Units & Output Units to implement this design.
- Three scenes are required for the open area Dining/Kitchen/Lounge area as well as an all off key function.

C-Bus House Exercise



- **Scene 1: Cooking**
- Kitchen Down Lights 100%
- Fluoro 100%
- Dining Down Lights 50%
- Lounge Centre Lights 30%
- Lounge Wall Lights Off

- **Scene 2: Dining**
- Kitchen Down Lights 20%
- Fluoro Off
- Dining Down Lights 70%
- Lounge Centre Lights Off
- Lounge Wall Lights 15%

- **Scene 3: TV**
- Kitchen Down Lights 30%
- Fluoro Off
- Dining Down Lights Off
- Lounge Centre Lights Off
- Lounge Wall Lights 20%

continued next page

continued from previous page

- The Light Level Sensor is to control the external 100W Incandescent Light.
- The PIR is to be set to activate the Hall light.
- The external 150W Floodlight can only be turned on if it is dark.
- The Bathroom Exhaust Fan is to come on when the Bathroom Light is switched on, but should remain on for 10 minutes after the Bathroom Light is switched off.
- Bedroom 2 to have a "Night Light" (30%) setting.
- Bedroom 1 to have an all off switch (except for Bedroom 2 and this bedroom).

Use the separate supplied sheets to design & document the installation.

Exercise 10 – Fault Finding

This exercise, when working correctly, should have the 4 Key Unit buttons 1 to 4, switching Lamps 1 to 4 ON & OFF.
The 8 Key NEO should be operating as toggle dimmers on Lamps 1 to 8 respectively.
Find, fix & document faults.

Fault	Fix

Optional Exercises

Exercise 11

- **Program 12 Channel Relay**

  Ch1to Ch4 = Warehouse.
  Ch1 set to turn on at 20%.
  Ch2 set to turn on at 40%.
  Ch3 set to turn on at 60%.
  Ch4 set to turn on at 80%.
  Ch5 = Store.
  Ch6 = Stairwell.

- **Program 8 Channel Dimmer**

  Ch1 = Board Room.
  Ch2 = Stage Lights.
  Ch3 = Wall Lights

- **Program 4 Key Input**

  Key 1 = Warehouse, Toggle Dimmer.
  Key 2 = Store, 5 sec timer. Toggle Timer
  Key 3 = Stairwell, 10 sec Retrig. Timer.
  Key 4 = Wall Lights, 40% preset.

- **Program 8 Key NEO**

  Key 1 = Board Room, Memory Dimmer.
  Key 2 = Stage lights, Memory Dimmer.
  Key 3 = Wall Lights, Memory Dimmer.
  Key 4 = Warehouse, Memory Dimmer.
  Key 5 = Stairwell, 10 sec Retrig Timer.

Exercise 12 – Timer Challenge 1

- **Program the 8 Channel Dimmer**
  Ch1 = Light 1
  Ch2 = Light 2
  Ch3 = Light 3
  Ch4 = Light 4
- **Set the 1 Key Unit as a timer**
  Light 1 = 5 Seconds
  Light 2 = 10 Seconds
  Light 3 = 15 Seconds
  Light 4 = 20 Seconds

- Program so the four lights will all switch **ON** at the same time. After the time periods the lights should switch **OFF**.
- Once you have done this, reverse it so the lights start in the **OFF** position and come **ON** after their time periods.

Exercise 13 - Timer Challenge 2

- **Program the 8 Channel Dimmer**
  Ch1 = Bathroom Light
  Ch2 = Bathroom Fan

- **Configure the 1 Key Unit so that:**

  On the first press the Bathroom Light and the Bathroom Fan switch on.

  On the second press the Bathroom Light switches off, but the fan stays on for 10 seconds.

Exercise 14 – PIR Disable

Program the 8 Channel Dimmer Channel 1 to Light 1 and use this for your Output.

PIR Disable 1

Customer wants to disable the PIR so that the Light will stay on.

- Configure the 2 Key Unit so that Key 1 disables the PIR and Key 2 toggles the Light.

PIR Disable 2

- Configure the 1 Key Unit so that the light comes on and the PIR is disabled.

PIR Disable 3

Customer wants to disable the PIR so that the light will stay off.

- Configure the 1 Key Unit so that when the switch is turned off, the PIR is disabled and the light stays off.

PIR Disable 4

Set up the PIR so the Bathroom light comes on when it is dark, but the fan always comes on.

C-Bus Unit Allocation Table

Unit Description	Current (mA)	Location	Unit Address

Ref:	**Unit Type:** PC Interface	**Unit Address:**
Network: Local	**Clock:**	**Burden:**
Part Name:	**Tag Name:**	
Notes:		

Ref:	**Unit Type:** RELDN12	**Unit Address:**
Network: Local	**Application:**	**Part Name:**
Location:	**Area:**	

Channel	**Group**	**Notes**
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____
11	_____	_____
12	_____	_____

Notes:

Channels

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Logic Groups**
And													
Or													

Ref:	**Unit Type:** DIMDN8	**Unit Address:**
Network: Local	**Application:**	**Part Name:**
Location:	**Area:**	

Channel	**Group**	**Notes**
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____

Notes:

	Channels								**Logic Groups**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
And									
Or									

Ref:	**Unit Type:** Key1	**Unit Address:**
Network: Local	**Application:**	**Part Name:**
Location:	**Area:**	

Key	**Group**	**Function**	**Notes**
1	_____	_____	_____

Notes:

Ref:	**Unit Type:** Key2	**Unit Address:**
Network: Local	**Application:**	**Part Name:**
Location:	**Area:**	

Key	**Group**	**Function**	**Notes**
1	_____	_____	_____
2	_____	_____	_____

Notes:

Ref:	Unit Type: Key4	Unit Address:
Network: Local	Application:	Part Name:
Location:	Area:	

Key	Group	Function	Notes
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____

Notes:

Ref:	Unit Type: KEYM4	Unit Address:
Network: Local	Application:	Part Name:
Location:	Area:	

Key	Group	Function	Notes
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____

Notes:

Ref:	Unit Type: KEYM8	Unit Address:
Network: Local	Application:	Part Name:
Location:	Area:	

Key	Group	Function	Notes
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
6	_____	_____	_____
7	_____	_____	_____
8	_____	_____	_____

Notes:

Ref:	**Unit Type:** SENLL	**Unit Address:**
Network: Local	**Application:**	**Part Name:**
Location:	**Area:**	

	Group	**Indicator**	**Notes**
Light Level	_____	☐	_____
Light On/Off	_____	☐	_____
Enable Group	_____	☐	_____

Target Lux: _____ **Margin:** _____

Notes:

Ref:	**Unit Type:** SENPIR(IA)(SS)	**Unit Address:**
Network: Local	**Application:**	**Part Name:**
Location:	**Area:**	

	Group	**Function**	**Expiry Time**	**Expiry Function**
Day-time Movement (LI)	_____	_____	_____	_____
Night-time Movement (DA)	_____	_____	_____	_____
Use Same Response as Daytime ☐				
Sunset to Sunrise (SS)	_____	_____	_____	_____
Security (SE)	_____	_____	_____	_____
Sensor Enable/Disable	_____			

Enables ☐ **Disables** ☐

Notes:

Unit Type: KEYM4		**Unit Address:**		**Location:**		**Trigger Group:**	
Scene 1:		**Scene 2:**		**Scene 3:**		**Scene 4:**	
Key:	**Ramp Rate:**	**Key:**	**Ramp Rate:**	**Key:**	**Ramp Rate:**	**Key:**	**Ramp Rate:**
Action Selector:		**Action Selector:**		**Action Selector:**		**Action Selector:**	
Group	**%**	**Group**	**%**	**Group**	**%**	**Group**	**%**

Unit Type: KEYM8	**Unit Address:**	**Location:**	**Trigger Group:**

Scene 1:		**Scene 2:**		**Scene 3:**		**Scene 4:**	
Key:	**Ramp Rate:**	**Key:**	**Ramp Rate:**	**Key:**	**Ramp Rate:**	**Key:**	**Ramp Rate:**
Action Selector:		**Action Selector:**		**Action Selector:**		**Action Selector:**	
Group	**%**	**Group**	**%**	**Group**	**%**	**Group**	**%**

Scene 5:		**Scene 6:**		**Scene 7:**		**Scene 8:**	
Key:	**Ramp Rate:**	**Key:**	**Ramp Rate:**	**Key:**	**Ramp Rate:**	**Key:**	**Ramp Rate:**
Action Selector:		**Action Selector:**		**Action Selector:**		**Action Selector:**	
Group	**%**	**Group**	**%**	**Group**	**%**	**Group**	**%**

C-Bus Reserved Application Addresses

As you may know C-Bus Toolkit allows you to create new Applications each of which can have up to 255 Group Addresses. But its important to note that some Application Addresses are Reserved... for backward compatibility however Toolkit allows you to create Applications at almost any Address.

Future releases of Toolkit will nag you if you use a reserved application, so get into the habit now of using the right ones.

So what can you use safely? Here's a list of what Clipsal currently uses or has planned for Application Addresses:

25 Temperature Broadcast
38 Room Control System (Clipsal 5 Star)
48 - 94 Lighting
95 Dali Gateway Interface Default Application
112 Ventilation (dampers and fans)
113 Irrigation Control
114 Pool, spa, pond and fountain control
136 Heating (Clipsal 5 Star)
202 Trigger Control (Clipsal SceneMaster, IR Output)
203 Enable Control
205 Audio/Visual
208 Security
209 Metering (gas, water, electricity, oil, etc)
223 Clock and Timekeeping
224 Telephony Status & Control
228 Measurement (light, liquid, temperature, etc)
255 C-Bus Network Management and Control

As you can see, there's 46 Application Addresses that are designated as "Lighting" between 48 and 94 (inclusive). You can safely use ANY of these addresses without fear that Clipsal will later allocate one of these to some form of specialised role on the Network. Stick to these Addresses.

The default lighting application is 56. If you need a few more, start from 57 and work up from there – it’s simple and easily recognisable.

The list above is not complete, we have roughly another 20 that we will reserve shortly for other functions that will be supported by future hardware. Once again, they will NOT be in the range 48-94.

CLIPSAL
INTEGRATED SYSTEMS

NOTE #: 05-032-1

DATE: 6 December 2005

KEY WORDS:

APPLICATION NOTE

SHARING INTELLIGENT SOLUTIONS

Title:	Decimal, Hexadecimal and Percentage conversions
Products Applicable:	Any products that support remote triggering

This document displays the equivalent conversions between Decimal, Hexadecimal and Percentages for C-Bus Addressing and Remote Triggering.

Decimal (d)	Hexadecimal (h)	Percentage (%)
000	00	0
001	01	
002	02	1
003	03	
004	04	
005	05	2
006	06	
007	07	3
008	08	
009	09	
010	0A	4
011	0B	
012	0C	5
013	0D	
014	0E	
015	0F	6
016	10	
017	11	7
018	12	
019	13	
020	14	8

021	15	
022	16	9
023	17	
024	18	
025	19	10
026	1A	
027	1B	
028	1C	11
029	1D	
030	1E	12
031	1F	
032	20	
033	21	13
034	22	
035	23	14
036	24	
037	25	
038	26	15
039	27	
040	28	16
041	29	
042	2A	
043	2B	17
044	2C	
045	2D	18
046	2E	
047	2F	
048	30	19
049	31	
050	32	
051	33	20
052	34	
053	35	21
054	36	

055	37	
056	38	22
057	39	
058	3A	23
059	3B	
060	3C	
061	3E	24
062	3D	
063	3F	25
064	40	
065	41	
066	42	26
067	43	
068	44	27
069	45	
070	46	
071	47	28
072	48	
073	49	29
074	4A	
075	4B	
076	4C	30
077	4D	
078	4E	
079	4F	31
080	50	
081	51	32
082	52	
083	53	
084	54	33
085	55	
086	56	34
087	57	
088	58	

089	59	35
090	5A	
091	5B	36
092	5C	
093	5D	
094	5E	37
095	5F	
096	60	38
097	61	
098	62	
099	63	39
100	64	
101	65	
102	66	40
103	67	
104	68	41
105	69	
106	6A	
107	6B	42
108	6C	
109	6D	43
110	6E	
111	6F	
112	70	44
113	71	
114	72	45
115	73	
116	74	
117	75	46
118	76	
119	77	47
120	78	
121	79	
122	7A	48

123	7B	
124	7C	49
125	7D	
126	7E	
127	7F	50
128	80	
129	81	
130	82	51
131	83	
132	84	52
133	85	
134	86	
135	87	53
136	88	
137	89	54
138	8A	
139	8B	
140	8C	55
141	8D	
142	8E	56
143	8F	
144	90	
145	91	57
146	92	
147	93	58
148	94	
149	95	
150	96	59
151	97	
152	98	
153	99	60
154	9A	
155	9B	61
156	9C	

157	9D	
158	9E	62
159	9F	
160	A0	63
161	A1	
162	A2	
163	A3	64
164	A4	
165	A5	65
166	A6	
167	A7	
168	A8	66
169	A9	
170	AA	67
171	AB	
172	AC	
173	AD	68
174	AE	
175	AF	69
176	B0	
177	B1	
178	B2	70
179	B3	
180	B4	
181	B5	71
182	B6	
183	B7	72
184	B8	
185	B9	
186	BA	73
187	BB	
188	BC	74
189	BD	
190	BE	

191	BF	75
192	C0	
193	C1	76
194	C2	
195	C3	
196	C4	77
197	C5	
198	C6	78
199	C7	
200	C8	
201	C9	79
202	CA	
203	CB	
204	CC	80
205	CD	
206	CE	81
207	CF	
208	D0	
209	D1	82
210	D2	
211	D3	83
212	D4	
213	D5	
214	D6	84
215	D7	
216	D8	85
217	D9	
218	DA	
219	DB	86
220	DC	
221	DD	87
222	DE	
223	DF	
224	E0	88

225	E1	
226	E2	89
227	E3	
228	E4	
229	E5	90
230	E6	
231	E7	
232	E8	91
233	E9	
234	EA	92
235	EB	
236	EC	
237	ED	93
238	EE	
239	EF	94
240	F0	
241	F1	
242	F2	95
243	F3	
244	F4	96
245	F5	
246	F6	
247	F7	97
248	F8	
249	F9	98
250	FA	
251	FB	
252	FC	99
253	FD	
254	FE	
255	FF	100

Technical Support and Troubleshooting

For technical assistance call: 1300 722 247 (Australia)
0800 888 219 (New Zealand)

CIS web site: http://www.clipsal.com/cis/

CLIPSAL INTEGRATED SYSTEMS
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E.S.P

Memo

TECH SUPPORT EMAIL: **tech.training@cispl.com.au**

To : All CIS customers within Australia & NZ **Date:** **07-06-2004**

Subject : "Table: Recommended Maximum Quantities of electronic transformers on specific Clipsal dimmers."

If you are not aware of the table, its purpose is *"to list various Clipsal Integrated Systems Leading Edge type Dimmers and the recommended maximum quantities of electronic transformers that can be connected to them."* The table is not applicable to the dimmers, 32E450TM, 32E500FM, 31E800T.

Listed Transformers:

The transformers listed on the table have previously been submitted by either the manufacturer or in most cases by the contractors / installers who are using that particular transformer.

Based upon the capacitance loading and the V.A. rating of the transformer we have then calculated the recommended maximum quantity of transformers that should be connected to our dimmers. We have in the past, inspected transformers, to determine the capacitance (nF) loading of the transformers. We wish to advise that we no longer provide this inspection service.

Supply of Formulas:

To give an installer the ability to work out how many electronic transformers can be fitted to a Clipsal dimmer, we have documented the process / formulas that we use for the dimmer calculations.

With the correct use of the supplied formulas, an installer will then be able to perform the calculations based upon your preferred transformer.

The two required values from the transformer are:

- V.A rating
- Capacitance loading

V.A. Rating:

The Maximum V.A rating of the transformer is typically printed on the casing of the transformer itself, so obtaining this should pose no problem. Note that we are referring to the maximum V.A of the transformer itself, *not the V.A. rating of any lamp or lamps attached to the transformer.*

Capacitance Loading Value:

A higher value of capacitance (typically > 100nF) on a transformer will present a higher loading to any "Leading Edge" dimmer controlling it, hence, the lower the capacitance, the better. Not all transformers exhibit a capacitance loading effect. In most cases a capacitor is used to ensure compliance with EMC standards. This in itself causes much of the capacitive loading effect. "Trailing Edge" design dimmers do not suffer from capacitance loading.

The capacitance value will rarely be listed on the unit itself but may possibly be documented in its instructions. If the capacitance value is not displayed, the installer will then be required to source this value from where they purchased the transformer.

FORMULAS

1/ Standard Series, Leading Edge, High Power Dimmers, 32/1000 & 32/2400

STEP 1:

$$A = \frac{\text{(Transformer) V.A}}{\text{(Transformer) nF}}$$

If this value is less than “0.85”, then the transformer is deemed as *not recommended*, (N R) due to its high capacitive loading in comparison to its V.A. output.

If this value is greater than “0.85”, then the transformer is deemed to have an acceptable Capacitance to V.A ratio.

Based upon an acceptable result in “Step 1”, the following formula would then be used:

STEP 2:

$$\text{“X” (Rounded Down)} = \frac{\text{(Dimmer Channel) Maximum V.A.}}{\text{(Transformer) V.A.}}$$

***X* =** *“the recommended maximum quantity of electronic transformers to be connected to that dimmer channel.”*

Note:
Whilst an electronic transformer may be listed as “not recommended” on the CIS Table; *“Recommended Maximum Quantities of electronic transformers on specific dimmers”,* there is a possibility that it may still be used, however, there is a limitation.

The limitation is that the dimmed circuit will need to be divided into parallel sub-circuits of 400 V.A. or less. Each of these sub-circuits would then require 1 of the 32EIND inductors connected into it.

The 32EIND is a Clipsal product and can be ordered from normal distribution channels such as Electrical Wholesalers.

2/ C-Bus Leading Edge dimmer formula for number of electronic transformers

The appropriate maximum "Capacitance and V.A" loadings for C-Bus Dimmers are listed in a table on the last page of this document.

Note: **All 3** of the following steps must be completed in order to obtain the correct recommended quantity of electronic transformers.

STEP 1: "Value A" - the "maximum quantity of transformers based upon the transformers individual nF loading on the dimmer channel".

$$\text{"Value A" (Rounded down)} = \frac{\text{Dimmer Channel Maximum Capacitance "nF"}}{\text{Individual Transformer "nF"}}$$

STEP 2: "Value B" - the "max quantity of transformers based upon the transformers individual V.A Loading on the dimmer channel".

$$\text{"Value B" (Rounded Down)} = \frac{\text{Dimmer Channel Maximum "V.A."}}{\text{Individual Transformer "V.A."}}$$

STEP 3:

Values "A" & "B" are then compared, *the lesser value is then used as* ***"X".***

Where

X = *"the recommended maximum quantity of electronic transformers to be connected to that dimmer channel."*

Example: Step 1 - $\frac{\text{Din Dimmer (300nf)}}{\text{transformer (100nf)}} = \mathbf{3}$

Step 2 - $\frac{\text{Din Dimmer (240VA)}}{\text{transformer (60VA)}} = \mathbf{4}$

Step 3 - Compare "Step 1 Value = **3**" "Step 2 Value = **4**".

Result: The lower value of **"3"** is used for how many transformers are "recommended".

The maximum "Capacitance and V.A" loadings for C-Bus Dimmers are listed in a table on the last page of this document or alternatively available from the Clipsal Integrated systems Website.

www.clipsal.com/cis

Relevant details of C-Bus Leading Edge dimmers.

	C-Bus Leading Edge Dimmers			
	Part Number	Number of channels	Maximum nF per channel	Maximum V.A. per channel
DIN	L5508D1A	8	300	240
	L5504D2A	4	300	480
OLD	5104D750	4	300	750
PRO	L5104D5	4	1000	1200
	L5102D10	2	1000	2400
	L5101D20	1	1000	4800

Note relating to the previously mentioned document

Document titled "Table: Recommended Maximum Quantities of Electronic transformers on specific Clipsal dimmers".

High Power Dimmers & C-Bus Dimmers
Various transformers on the table may be listed as "N C" or "not compatible" in some of the columns. This is typically due to the manufacturer stating that the transformer is only suitable for "TRAILING EDGE" type dimmers.

Any detail on this trailing edge dimming control requirement has either been printed on the product itself or written in the manufacturers instructions supplied with the product.

High Power Dimmers only
Various transformers on the table may be listed as "N.R" or "not recommended", this is due to the ratio of transformer V.A. to the transformers capacitance. For further detail please refer back to page 2 of this document.

Technical Support & Training Department
Clipsal Integrated Systems Pty Ltd,
tech.training@cispl.com.au
Ph: 1300 722 247 (within Australia)

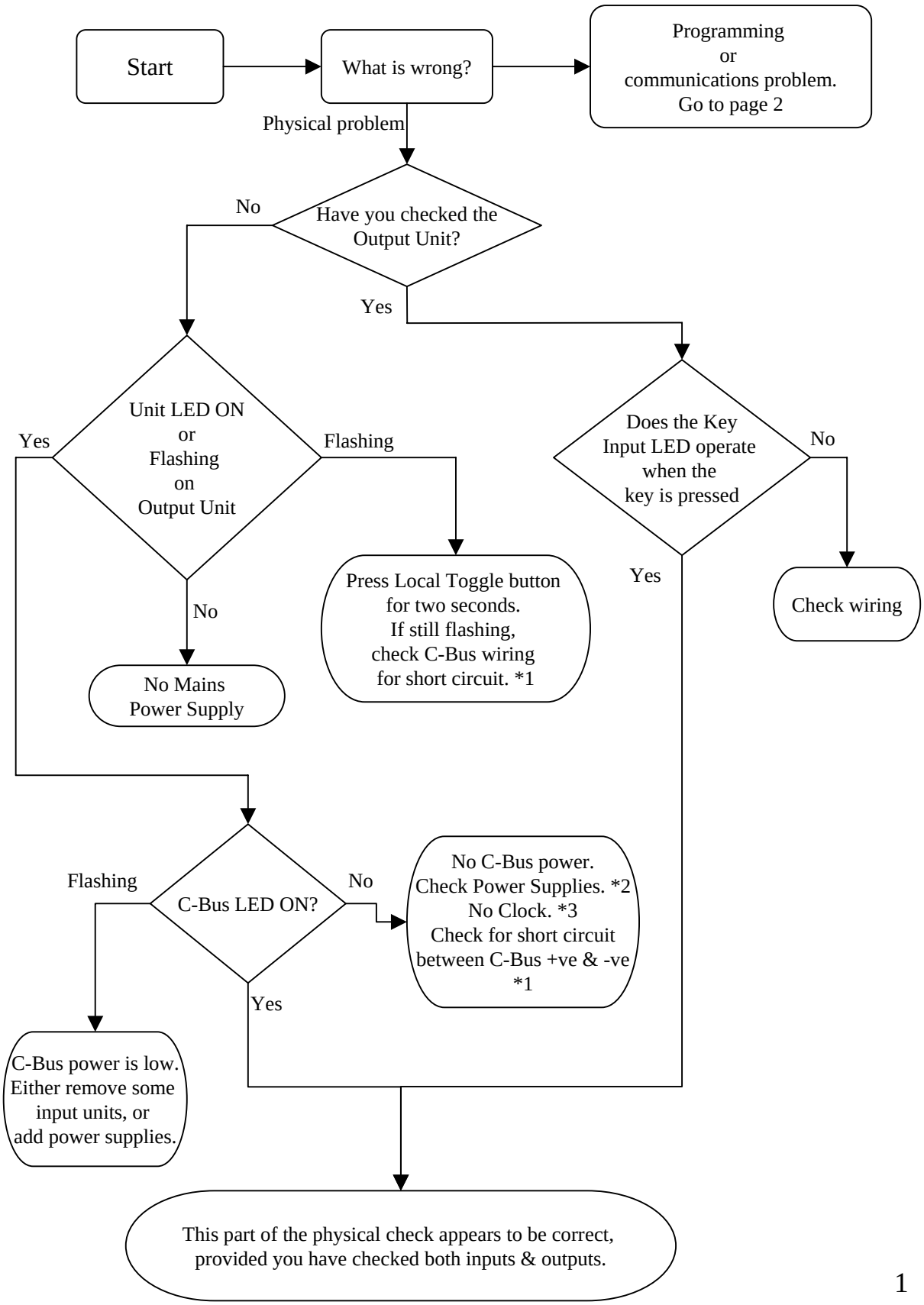
C-Bus Unit Current Requirements

Part Number	Description	C-Bus Current (mA)
503X	Key Input Unit Standard	18
R506X	Key Input Unit Reflection,	18
5084, 5085, 5054, 5055	Key Input Unit DLT	22
5082, 5084, 5086	Key Input Unit Saturn	22
5052, 5054, 5058	Key Input Unit NEO	22
5104AM	Analogue Output Unit	18
5102RVF	2 Channel Relay (36mA for programming only)	0
5512, 550x	Relays, Dimmers	0
5112D….,510XD…	PRO Dimmer (60mA Internal Power Supply)	0
L5504AMP	Analogue Output	18
5034NIRT	C-Bus Infrared Transmitter (NIRT)	32
5800WGA	Wireless Gateway	32
5504GI	General Input Unit	18
5104BCL	Bus Coupler	18
5031PE	C-Bus Light Level Sensor	18
5035NIRS	Scene Master	36
5000CT	C-Bus Touch Screen B & W	40
5000CTC 5050CTC 5080CTC	C-Bus Touch Screen Colour	22
5753	C-Bus Multi-Sensor	18
E5751	PIR Occupancy Sensor	18
5100PC	PC Interface	32
5500NB	Network Bridge	18
5100NA	C-Bus Network Analyser	20
5502DAL	DALI Gateway	32
5500NMA	Network Monitor	18
5500PACA	Pascal Automation Controller	32
5100T	C-Bus Telephone Interface	18
560110, 560125	Multi Room Audio Amplifier	22
560884	Multi Room Audio Matrix Switcher (Internal 330mA supply).	0
L5508DSI	DSI Gateway. (If no mains power connected 18mA for programming).	0
5500CN	CNI (Separate 9 – 12v supply)	0
5031V2TC7, 5031H2TC7	Digital Clock	18
5750WP	Infrascan	18

C-Bus Installation Fault Finding Chart

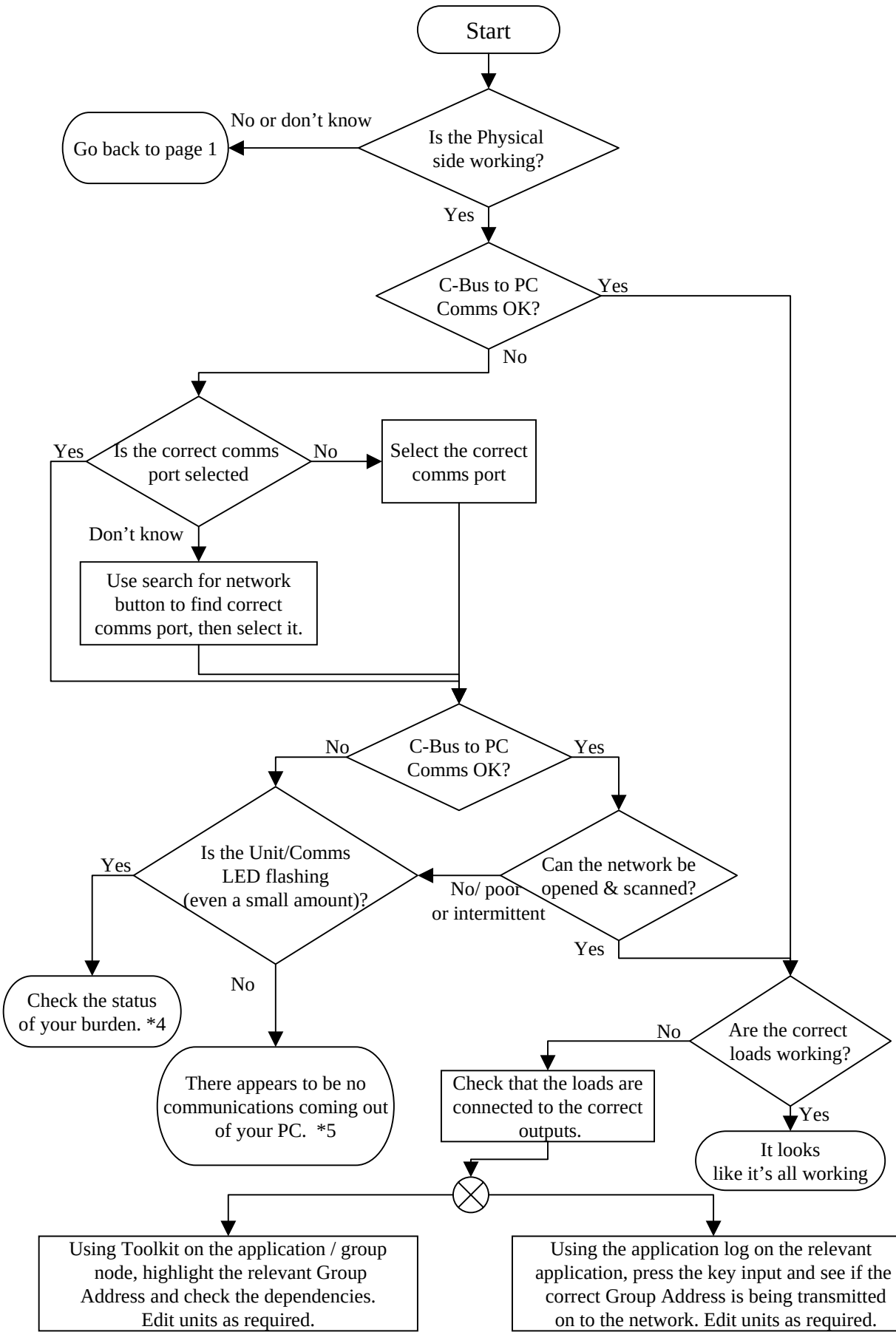
The intention of this fault finding chart is to guide the user into deducing possible installation faults.

It is not exhaustive and with experience you may be able to short cut certain areas.



C-Bus Installation Fault Finding Chart

It is very important that the physical side of the installation is correct before continuing with this section.



C-Bus Installation Fault Finding Chart

Note *1

Checking the Pink cat 5 between C-Bus positive (Blue and Orange) and Negative (Blue/white and Orange/white). Use a multimeter start on the DC voltage range to confirm there is no voltage . Then change to the ohms range, and break the circuit down in to segments until the short can be identified.

If the Unit LED is flashing, check for short circuit between C-Bus negative and Brown/Brown-White and C-Bus negative and Green/Green-White.

Note *2

Power supply units check that there are sufficient Power supplies to power the system.

Din rail output unit with power provide 200 mA

Din rail stand alone PSU provides 350 mA

Pro series dimmers provide 60 mA

Typical current demands are

PCI =32 mA

PIR's =18 mA

Neo type Key Input =22 mA

Standard Key input = 18 mA

Mono touch screen = 40 mA

Colour touch screen = 22 mA

Note *3

If there is no clock present on a C-Bus2 system, and you do not have an alternative device capable of generating a clock (with its clock enabled) that may be connected to the system then, use learn mode to enable the clock. Enter learn mode and wait until the unit light and C-Bus light flash alternatively. This may take a while if after one minute the lights are not flashing alternatively then come out of learn mode and try again. For more info please see the training manual C-Bus2 Learn Mode Operation and Programming, Part A Getting Started pages 6 –8.

Note *4

Confirm you have one burden if suggested by toolkit, (as a general guide if you have less than 70 units you will need one burden).

If you do not have a hardware burden on the network and appear to have comms problems adding a burden may help. If possible add a hardware burden, if not software one may be enabled using learn mode. See the training manual C-Bus2 Learn Mode Operation and Programming, Part B Advance programming guide page 12.

Note*5
There appears to be no communications coming out of your computer.

- Check the RS 232 cable possibly the easiest way would be to try another one
- Are you using an USB to RS232 converter if so check that it is present on the device manager list and what comms port is it assigned to. Using the Help feature window provides type in device manager.
  Also have the drivers that come with the converter been installed see the manufacturer's info.

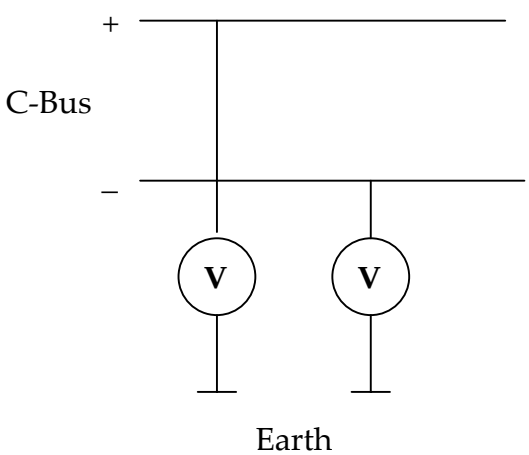
Intermittent Faults

Intermittent faults are somewhat harder to diagnose.
Check the following, which have proven to be some of the more common issues:

C-Bus cables all correctly terminated and dry.

Check C-Bus voltage is in the correct range.
Add one extra unit at the far end of the C-Bus network to see if the network fails.
If either of the above, add an additional power supply.

Check voltage as below:



Each reading should be similar, if not, look for one of the C-Bus lines gone down to earth. Possibly twisted around front plate screw of key input unit.

CLIPSAL INTEGRATED SYSTEMS

C-Bus training Course

Introduction to C-Bus
Assessment

Name: _____ Date: _____

Trainer: _____

RESULTS

Description	Competency Achieved
C-Bus terminology	
C-Bus issues & problems	
Programming / Toolkit	
Fault Finding	

Revision Number: V1.2

V1.2 April 2006

C-Bus terminology

1. What is the maximum current allowed on a C-Bus network?

2. What is the maximum total cable length allowed on a C-Bus network?

3. What cable core colours are used for the C-Bus?

4. Name the five different address types used in C-Bus programming.

5. Name three different categories of C-Bus Unit.

6. What is the recommended maximum number of Units you can have on a single C-Bus network?

7. A Network Bridge is a C-Bus unit that passes C-Bus commands between two networks while:
    - Maintaining the same C-Bus Clock on both networks.
    - Maintaining electrical isolation between C-Bus networks.
    - Maintaining electrical isolation between C-Bus and Ethernet networks.
    - Maintaining electrical isolation between the PC's Serial Port and C-Bus.

8. What is the purpose of the Clock in a C-Bus installation?
    - To keep time
    - To synchronise communications
    - To operate timers
    - To measure how long the C-Bus has been operating

9. What is the purpose of the Burden in a C-Bus installation?

- To correct network voltage
- To allow correct communications
- To load the network
- To allow the clock to operate

10. What is meant by the term "Tag" as used in C-Bus programming?

- A "Tag" is used to label the project.
- A "Tag" is a meaningful name for a C-Bus Group Address.
- A "Tag" is used to attach a C-Bus unit to the bus.
- A "Tag" is used to terminate the C-Bus.

C-Bus issues & problems

1. What topologies can be used when connecting C-Bus units on a single network? (Circle all that apply)

- Daisy Chain
- Star
- Combination Daisy Chain and Star
- Closed Ring

2. What is the maximum number of networks that can be connected in a 'Daisy Chain" or series connection?

3. If the Unit LED & C-Bus LED on a C-Bus Output Unit are lit, does this indicate the status of the Network Burden?

4. What is the recommended minimum separation between a C-Bus cable and a mains cable when run in parallel?

5. Can a DIN Rail Dimmer unit have its 240v inputs (control stage and switching stage) connected to different phases?

6. When Mains power is connected to a dimmer unit, and the local toggle indicator is OFF, what voltage can be measured at the load terminals with no load connected?

7. What is the recommended minimum C-Bus voltage?

8. What methods may be used to connect C-Bus cables together in a key input unit? (Circle correct answers).

- Screw terminals
- Soldering
- Crimping

9. When a C-Bus cable must cross a mains cable, C-Bus must have adequate segregation as well as crossing at an angle of:

- 25 Degrees
- 75 Degrees
- 45 Degrees
- 90 Degrees

10. Power supplies

What is the minimum number of dimmer units with power supplies would you need to order to implement this installation correctly?

Unit	mA per unit	Qty	Total Current
6 Gang Saturn Key Input Unit		4	
4 Gang Key Input Unit		1	
DIN Rail PC Interface Unit		1	
5 Gang DLT Input Unit (Neo)		3	
Passive Infra-Red Motion Detector		1	
DIN Rail 8 Channel Dimmer, 1A per channel		3	
		Total Current	

Programming / Toolkit

Mark off the exercises in the following table as you complete them.

Essential Exercises		Optional Exercises	
Exercise No.	Completed	Exercise No.	Completed
1		11	
2		12	
3		13	
4		14	
5		15	
6			
7			
8			
9			
10			

Fault finding

The Training Board has been programmed with some deliberate faults.
Using Toolkit, find and fix these faults. Document what you do in the following table.

Fault Description	Solution